What is Claimed Is:

1. A method of forming a layer of a hard, dense, and abrasion and corrosion resistant material on a surface of a substrate, comprising sequential steps of:

(a) providing a substrate having at least one surface adapted for deposition thereon;

(b) forming on said at least one surface of said substrate a layer of undoped tetrahedral amorphous carbon (ta-C) having a high mass density of carbon (C) atoms greater than about 2.5 gms/cm^3; and

(c) forming on said layer of undoped ta-C a layer of nitrogen-doped tetrahedral amorphous carbon (ta-C:N) having a high mass density of carbon (C) atoms greater than about 2.0 gms/cm^3.

2. The method according to claim 1, wherein:

step (c) comprises forming said nitrogen-doped layer of ta-C:N with a nitrogen-to-carbon atom ratio (N/C) of up to about 0.3.

3. The method according to claim 2, wherein:

step (b) comprises forming said layer of undoped ta-C by means of a filtered cathodic arc deposition (FCAD) process performed in a vacuum chamber and utilizing an undoped carbon cathode; and

step (c) comprises forming said nitrogen-doped layer of ta-C:N by means of a FCAD process utilizing said undoped carbon cathode and a nitrogen-containing gas introduced to said vacuum chamber.

4. The method according to claim 3, wherein:

step (c) comprises introducing nitrogen gas (N_2) to said vacuum chamber at a flow rate up to about 100 sccm.

5. The method according to claim 3, wherein:

step (a) comprises providing a disk-shaped substrate including a stacked plurality of thin film layers on at least one surface thereof, said layers including at least one magnetic or magneto-optical (MO) recording layer; and

step (b) comprises forming said layer of undoped ta-C on an exposed surface of an outermost layer of said stacked plurality of layers.

6. The method according to claim 5, wherein:

step (b) comprises forming said layer of undoped ta-C at a thickness from about 1 to about 100 Å; and

step (c) comprises forming said layer of nitrogen-doped ta-C:N at a thickness from about 1 to about 50 Å.

7. The method according to claim 6, wherein:

step (b) comprises forming said layer of undoped ta-C at a thickness from about 5 to about 30 Å; and

step (c) comprises forming said layer of nitrogen-doped ta-C:N at a thickness from about 5 to about 20 Å.

8. The method according to claim 5, wherein:

steps (b) and (c) together form a layer of said hard, dense, and abrasion and corrosion resistant material having a combined thickness from about 10 to about 50 Å.

9. A recording medium, comprising:

(a) a substrate having at least one surface;

(b) a stacked plurality of thin film layers on said at least one surface thereof, said layers including at least one magnetic or magneto-optical (MO) recording layer; and

(c) a protective overcoat layer on an outer surface of an outermost layer of said stacked plurality of thin film layers, wherein said protective overcoat layer comprises:

(i) a first sub-layer layer (c_1) of undoped tetrahedral amorphous carbon (ta-C) on said outer surface of said outermost layer of said stacked plurality of thin film layers and having a high mass density of carbon (C) atoms greater than about 2.5 gms/cm^3; and

(ii) a second sub-layer (c_2) of nitrogen-doped tetrahedral amorphous carbon (ta-C:N) on said undoped ta-C layer and having a high mass density of carbon (C) atoms greater than about 2.0 gms/cm^3.

10. The recording medium as in claim 9, wherein:

said second sub-layer (c_2) of ta-C:N has a nitrogen-to-carbon atom ratio (N/C) of up to about 0.3.

11. The recording medium as in claim 10, wherein:

said first sub-layer (c_1) of undoped ta-C has a thickness from about 1 to about 100 Å; and

said second sub-layer (c_2) has a thickness from about 1 to about 50 Å.

12. The recording medium as in claim 11, wherein:

said first sub-layer (c_1) of undoped ta-C has a thickness from about 5 to about 30 Å; and

said second sub-layer (c_2) has a thickness from about 5 to about 20 Å.

13. The recording medium as in claim 10, wherein:

said protective overcoat layer (c) has a combined thickness of said first and second sub-layers ($c_1 + c_2$) from about 10 to about 50 Å.

14. A hard, dense, and abrasion and corrosion resistant material useful in forming a protective overcoat layer for a magnetic or magneto-optical recording medium, which material comprises:

(a) a first region of undoped tetrahedral amorphous carbon (ta-C) having a high mass density of carbon (C) atoms greater than about 2.5 gms/cm^3; and

(b) a second region of nitrogen-doped tetrahedral amorphous carbon (ta-C:N) having a high mass density of carbon (C) atoms greater than about 2.0 gms/cm^3.

15. The material according to claim 14, wherein the nitrogen-to-carbon ratio (N/C) of said second region is up to about 0.3.

16. The material according to claim 15, wherein:

said first region forms a first sub-layer; and

said second region forms a second sub-layer stacked on said first sub-layer.

17. The material according to claim 16, wherein:

said first sub-layer is from about 1 to about 100 Å thick; and

said second sub-layer is from about 1 to about 50 Å thick.

18. The material according to claim 17, wherein:

said first sub-layer is from about 5 to about 30 Å thick; and

said second sub-layer is from about 5 to about 20 Å thick.

19. The material according to claim 16, wherein:

said first and second sub-layers have a combined thickness from about 10 to about 50 Å.

20. A recording medium comprising a stack of thin film layers on a substrate and a protective overcoat layer formed of the material according to claim 16 with said first sub-layer formed in contact with an outermost layer of said stack.